

Strategy for Determining Local Area Need for Cardiovascular Surgical Services

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PLANNING AGENCIES AND PROVIDERS of health care must continually decide what services and facilities are needed, how these should be provided, and what amounts to provide. Usually unable to determine precisely the optimal resource allocation pattern, the decision maker must often compromise between two competing value positions.

One position, influenced by a locality's desire to have readily available a full range of sophisticated and specialized medical equipment, holds that all medical services which technically can be provided should be provided to everyone who needs these services.

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Opposed to this "professional" viewpoint is the more pragmatic "economic" viewpoint in which "need" or "best possible care" is subordinated to "most effective use" of scarce resources. (An extended discussion of these competing positions has been published (1).)

Unfortunately, the decision maker often finds that he has no rationale for the compromise beyond "budget constraints." In this paper we describe an approach, using cardiovascular surgical services to illustrate, which provides a defensible rationale in an area in which any decision arouses controversy. Equally important to those who must make fairly immediate decisions, the approach described does not require elaborate research protocols or lengthy and expensive studies.

Study Objectives

The Connecticut State Council on Hospitals, lacking data on, or even an accepted definition of, "need for cardiac surgery," asked the University of Connecticut Health Center, through its Community Studies Unit in the Department of Community Medicine, to conduct

a factfinding study (2). Specifically, information was sought on the number of cardiac surgery procedures performed in Hartford area hospitals, on the estimated number of surgical candidates within that geographic area, and on the costs, supportive facilities, and personnel associated with cardiac surgical units.

Methodology

The objectives of the study as originally conceptualized suggested the need for four interrelated activities. First, to estimate the need for cardiac surgery, it was necessary to determine the geographic area served and the incidence or prevalence of surgically remedial heart disease in that area. Thus, it was proposed that the area served be identified by reference to hospital records, with physician interviews used to determine patient referral patterns. The estimate of disease incidence or prevalence was assumed to be calculable from national data or such studies as the one in Framingham. Second, a statement on the resources required to meet cardiac surgery needs would be developed by means of standards recommended by various professional groups (3-5). Third, each study hospital would be surveyed to determine available and projected resources, present rate and types of cardiac surgery, costs associated with provision of this service, and results of surgery. Fourth, data related to costs and results for cardiac surgical units in selected non-Hartford areas would be collected for comparison.

Several factors forced modifications in this research strategy and the scope of the study. First, time and economic limitations, together with the unavailability of necessary data, restricted the study objectives to the determination of the area served by the Hartford hospitals and a comparison of expected and actual rates of cardiac surgery. Second, literature review, interviews, and analysis of the information available from previous studies, surveys, and ongoing data collection (6) indicated that the incidence estimation approach initially suggested was impractical for several reasons. Basically, the problem was that this epidemiologic approach required knowledge of (a) incidence or prevalence of cardiovascular diseases by type of disease or condition, (b) agreed-upon criteria for appropriate surgical intervention, and (c) proportion of patients in each diagnostic category who met the criteria and therefore were suitable candidates for surgery. Because none of this information was available, the approach to the estimation of need for cardiac surgery had to be revised.

The first step remained the definition of the area served by the Hartford hospitals. For this step, the medical record librarians of the hospitals were asked to pull all records of patients admitted within a 1-year period for whom a cardiovascular surgical procedure had been performed. These records were examined to learn (a) the specific procedure, (b) the patient's home address, and (c) the age and sex of the patient. These data were then used to determine the area served and

the local rate of cardiac surgery for comparison with national data.

Once the area served was known, the next step was the determination of potential caseloads. To estimate the population within the area 1970 census data were used, and rates of cardiac surgery for this population were then estimated. The estimated rates were based on both the locally derived and published national data on trends in surgery performed, broken down by type of surgery (open or closed heart) and by type of condition (congenital or acquired). Potential caseload estimates were calculated by multiplying these rates by the population in the area served.

The third step was to compare the estimated potential caseload for the area currently served by the hospitals and for a larger area that the hospitals conceivably might serve with the actual caseload in these hospitals. Admittedly, this comparison provides evidence that only suggests the extent to which an expected need within an area is being met. At the same time, it must be recognized that the lack of definitive data and agreed-upon criteria for surgical intervention, together with extension of surgical treatment to new problems, will make it impossible ever to define exactly "unmet needs." Furthermore, without evidence to suggest that funds will be available to increase substantially educational and screening programs, there seems little reason to base decisions about resource allocation on vague estimates of unmet needs. Such estimates undoubtedly would include patients not likely to be identified and brought to surgery under present program levels.

The final phase of the study was an investigation of the capacity of existing cardiac facilities to increase diagnostic and surgical services. In this phase, a decision about expansion of facilities must consider not only the numbers of patients to be served but also whether services are adequate to meet quality requirements, regardless of caseload.

Selected Findings and Discussion

Only the findings pertinent to an assessment of the methodology and its applicability elsewhere are reported here.

Geographic area served. A 100 percent sample of the records of all cardiac surgery patients admitted to the four area hospitals during the study period indicated that the geographic area served by the cardiac surgery units was basically the same as the hospitals' general service area. That is, approximately 82 percent of all patients for whom a cardiovascular surgical procedure was performed resided within the Capitol Region Health Service Area (greater Hartford). Contrary to what had been expected, this finding was important for two reasons.

First, to the extent that a facility serves a fairly well-defined area or population, the denominator problem in the use of a ratio approach to caseload estimates

is reduced. Obviously, for those few medical centers that draw patients from all countries in the world, the denominator problem would be great, but there is little question about continued support of the cardiac units in such centers.

Second, the almost complete lack of patients from outside the hospitals' general service area, despite the absence of cardiovascular diagnostic and surgical facilities in nearby areas, suggests the possibility of an untapped reservoir of potential demand. Consequently, it could be argued that the addition of diagnostic facilities in these areas or improved communications might increase use of the study hospitals by patients currently sent elsewhere. Put another way, there was no reason to suppose an absence of "need" for cardiovascular surgery among the population in other areas merely because only a few patients were referred to the study hospitals. Therefore, potential caseloads were estimated—not only for the Capitol Region Health Service Area, but also for two contiguous areas, the Northwest and Northeast Health Service Areas, which appeared to have the most potential for increased referrals and the least ability to develop alternate local diagnostic or surgical capability.

Caseload estimates. The estimates of potential caseloads reflect (a) population estimates as reported by the Department of Commerce or projected by the Connecticut State Office of Planning and (b) application of estimated rates of cardiac surgery to the populations of the geographic areas under study. Two sets of rates were developed.

The first set of rates is based on 1961–69 trends in cardiac surgery performed in all U.S. facilities. These rates were derived from information prepared by the Regional Medical Programs Service, based on a survey of American Hospital Association hospitals by the association and the Regional Medical Programs Service in June 1970 and on data reported by Crocetti (7).

One might argue that at best the first set of rates indicates capacity, rather than need, to perform operations. While partially true, such an argument ignores two things. First, several studies have revealed a significant underutilization of existing resources for open-heart surgery and cardiac catheterization throughout the United States. The results of investigations also suggest that capacity constraints have not been a major limitation on numbers of procedures performed locally. Second, since the data underlying the rates reflect national experiences, any differing professional judgments about suitability of candidate and differing local conditions tend to "wash out." In short, the rates do not truly measure need—which cannot be measured without generally accepted criteria for appropriate surgical intervention—but they do tend to measure identified need. As such, comparisons of the numbers one might expect to find with the numbers of procedures actually performed on a given

population can suggest the extent to which patients with potential identifiable cases are actually being surgically treated.

Recognition that the rates do not truly measure "total need" and that the current enthusiasm for bypass operations has significantly altered the potential demand does suggest, however, the need to make allowances for changes in technology and personnel as well as for the specific demographic characteristics of the local area population. Not to do so is to invite an estimate of potential future local caseload which errs in direction as well as in magnitude. For example, in the Hartford area hospitals, the number of cardiac surgical procedures performed in 1972 gave a rate per 100,000 population of 22.2, which was higher than the rate of services that prevailed for the nation as a whole. The local rate was even higher when the known surgical patients referred outside the Hartford area were included—it was then 27.4 per 100,000 population.

Examination of the past volume of operations and discussions with local physicians and surgeons indicated that this was not an isolated experience, but represented instead a possibility of a continually higher local rate. The second set of rates therefore assumes that this possibility will occur. More specifically, a second rate double that of the rate based on national trends seemed sufficient, based on known local rates, to compensate for the possibility of a continually higher local rate and to allow adequate leeway for technological advances or changes, or both, in medical judgment. Obviously, in some local areas a more appropriate second rate would be less than that derived from the national data. The two sets of rates of cardiac surgery caseloads are shown in the table.

Capacity of existing facilities. Chiefs of cardiology and of cardiovascular surgery and hospital administrators were interviewed about hospital capacity to perform diagnostic procedures and cardiac surgery. No attempt was made in advance to define capacity; rather, each person interviewed was asked to define his hospital's capacity based on availability of surgical teams, properly equipped operating rooms, inpatient facilities, and supportive services needed at various stages of diagnosis, surgery, and followup care.

The resultant estimates, of course, were not precise measures of capacity, but they did represent the best judgment of those most qualified to assess existing resources. As such, the responses were instructive. For example, according to the physicians and hospital administrators interviewed, existing resources were sufficient to allow performance of approximately 900 cardiac surgical procedures annually, even if we assume use at only 80 percent capacity. During the study period, however, only 258 operations were actually performed (although another 50 to 60 area residents were referred to nonstudy hospitals).

Estimated rates of cardiac surgery and expected caseloads in the Capitol (greater Hartford), Northwest, and Northeast health service area populations, 1971, 1975, and 1980

Year	Rate per 100,000	Capitol area		Northwest area		Northeast area		Total expected caseload
		Population	Expected caseload	Population	Expected caseload	Population	Expected caseload	
Continuation of 1961-69 trend								
1971	17.3	901,230	155.9	82,280	14.2	126,200	21.8	192
1975	19.6	989,780	194.0	89,200	17.5	143,970	28.2	240
1980	23.2	1,084,100	251.5	96,400	22.4	164,600	38.2	312
Double the 1961-69 trend								
1971	34.6	901,230	311.8	82,280	28.5	126,200	43.7	384
1975	39.2	989,780	388.0	89,200	35.0	143,970	56.4	480
1980	46.4	1,084,100	502.0	96,400	44.8	164,600	76.4	624

More important, the major impediment to even greater capacity to perform cardiac surgery was not absence of properly equipped surgical units, adequate inpatient services, or functioning diagnostic services. Instead, the major impediment was the absence of qualified cardiac surgeons. As a result, the addition of one or two cardiac surgeons in the study area would more than insure sufficient capacity to meet the most liberal estimate of demand offered in this study. For example, if we assume sufficient surgeons to perform only one cardiac surgical procedure a day in each of the presently available operating rooms for only 200 days a year, the present facilities would be sufficient to perform 1,000 operations annually. Yet the most liberal estimate was for only 624 procedures in 1980.

The estimate of cardiac diagnostic capacity was equally instructive. Each of the existing or soon-to-be available laboratories for cardiac catheterizations and angiocardiograms were capable of processing an average of two to three patients a day. These laboratories therefore could serve approximately 1,500 patients annually, working at only 80 percent capacity. By contrast, only 802 of these procedures were done on approximately 750 patients during the study year. Considering that two to three patients are studied for each patient who undergoes surgical treatment, we concluded that existing laboratory capacity would be sufficient to handle the maximum expected surgical caseload through 1980.

Quality considerations. Thus far, we have considered only the ability of existing facilities and resources to meet an expected increase in caseload. However, several groups have issued reports calling for an annual minimum number of procedures to be performed if quality is to be maintained. For example, the Inter-Society Commission for Heart Disease Resources, a national organization of professional societies charged with development of guidelines for cardiovascular

facilities, has recommended an annual minimum of 200 to 300 open heart procedures (that is, 4 to 6 procedures a week) and 300 catheterizations in hospitals providing these services (5). These minimums are higher than those recommended either by the American Heart Association, which advises 150 cardiac catheterizations and 75 extracorporeal bypass procedures a year if treating children or adults exclusively and these same numbers for each group if treating both age groups (4), or by the American College of Surgeons, which suggests 100 to 150 open-heart operations a year by an independent team (5).

The Hartford study did not endorse any recommendation on minimums. However, even on the basis of the lowest recommended minimum (100 operations annually by an independent team), the study estimates suggest a current need for no more than three surgical teams. This was fewer than the number already on board or planned in the study hospitals.

Conclusion

We believe that this approach which focuses on cases likely to be identified can be useful in estimating need for cardiac surgery, although we recognize that many might question that view. In particular, we would emphasize three points. First, the approach used effectively changed the question addressed. No longer were the investigators attempting to assess an impossible-to-quantify "need for cardiovascular surgery in a given population." Rather, the question became, What is the need for cardiovascular surgery units, considering the number of cases likely to be identified in a given population? This approach therefore does not require assumptions about criteria, quality of services, or efficacy of the procedure performed. Instead, it merely assumes that—given the criteria used to determine candidacy for surgery—technical and human constraints will affect the number of procedures a hospital cardiovascular surgical unit can perform. Consequently, it seeks to compare what can be done with the number

of cases likely to be identified as needing something to be done.

Second, the caseload estimates can be invalidated by the development of improved diagnostic or surgical techniques or by changes in the number of surgeons available, despite the use of trends and the two sets of rates. However, because the estimates are subject to qualifications does not negate their value for comparison with present use of available facilities and in determining need for increased capacity, as illustrated by two hypotheses the decision maker might advance, based on information provided through this study. One hypothesis is that if the national rate of cardiac surgery is greater than the local rate and the estimated future caseload approximates capacity of the facilities, the need for additional facilities would be considered great. The second hypothesis is that if the local rate exceeds the national rate and the estimates of future caseload indicate substantial underuse of existing facilities, then additional facilities are not needed. The approach we have suggested does provide the decision maker with more information on which to judge pressures on existing resources and, consequently, to judge the need for additional facilities.

Third, although subject to criticism and qualification, this approach has much to support it. First, without appropriate data, the more sophisticated estimation approach that was originally considered would require far more value judgments about determinants of need for and advisability of surgical intervention. The present approach, although not devoid of value judgments, does build on "hard" utilization facts in determining the future slope of the trend line. Second, because the approach uses both local and national rates and trends to develop a range of potential caseload, it implicitly takes into account such factors as geographic differences and historical changes in medi-

cal judgments and availability and acceptance of technological advances.

Thus, this approach is useful, but not unassailable; the information obtained is suggestive, not definitive; and the resource allocation decision is defensible, not unquestionable. Empirical evidence that this conclusion is true is the fact that the study results were not only accepted as useful by the Connecticut State Council on Hospitals but were also accepted as a basically valid description of the situation for cardiovascular surgical services, even by the surgeons and cardiologists in those hospitals whose plans were most adversely affected.

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SYNOPSIS

GLASGOW, JOHN M. (University of Connecticut Health Center), BRINZEY, CAROLYN, and PALADINO, DIANE: *Strategy for determining local area need for cardiovascular surgical services. Public Health Reports, Vol. 91, January-February 1976, pp. 67-71.*

At the request of the Connecticut State Council on Hospitals, a study was made of existing and needed facilities for cardiovascular surgery in the Hartford area. Adequate data on incidence or prevalence of cardiovascular disease were unavailable, and agreed-upon criteria for select-

ing suitable candidates for surgical intervention were lacking. It was therefore impossible to estimate need for cardiovascular surgery as a basis for determining the need for additional facilities.

Instead, estimates were made of potential caseloads, based on trends in rates of cardiac surgery nationwide for 1961-69 and on actual rates in the Hartford area hospitals in 1972. These estimates of potential caseloads were compared with the capacity of existing surgical units as determined by onsite sur-

veys of surgical units, diagnostic facilities, and supportive services and personnel.

The methods described provided evidence to suggest that expansion of cardiac surgical services in the Hartford area would be inappropriate. Of more practical import, the approach, although not unassailable, affords one mechanism for focusing discussion of need for facilities on questions of "probable use" of services, rather than on vague generalities based on unknown and immeasurable "needs" for cardiac surgery.